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(54) LAMINATE HAVING HEAT RAY REFLECTING FUNCTION

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a laminated film excellent in heat ray reflecting function and scratch resistance when used as a film for an indoor window and capable of keeping this effect over a long period of time.

SOLUTION: In a laminate wherein a heat ray reflecting layer (B), a photocatalytic function layer (C) and a surface protective layer (D) are laminated on the single surface of a transparent thermoplastic resin film in this order and a self-adhesive layer (E) and a release film (F) are laminated on the other surface thereof in this order, a ratio (Pa/Pb) of the peel strength (Pa [g/cm]) of the surface protective film (D) to the photocatalytic function layer (C) and the peel strength (Pb [g/cm]) of the self-adhesive layer (E) to glass is 0.9 or less.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] In case this invention carries out lamination construction in detail about the layered product which has a heat ray reflex function at an inside-of-a-house aperture, it excels in abrasion-proof nature, and a heat ray reflex function is shown, and, moreover, the function is related with the layered product which has the heat ray reflex function which can be maintained over a long period of time.

[0002]

[Description of the Prior Art] Generally a heat ray reflective film uses transparent polyester film as a base material, it is the layered product whose metal thin film layer was pinched by the transparence dielectric layer of a high refractive index as a heat ray reflecting layer, and while it lets a visible ray pass, it has the property of reflecting well the beam of light applied to infrared from the near-infrared section. Taking advantage of this property, raise the air conditioning effectiveness, the thermal reflection of a transparence food container is raised, or the heat ray reflective film is used [**** / reducing the thermal radiation from the monitor aperture in work in hot environment] for the application which intercepts the solar energy which carries out incidence from apertures for vehicles, such as a building, an automobile, or an electric car, and raises the heat insulation effectiveness in a frozen refrigeration showcase.

[0003] When using it especially, sticking on an inside-of-a-house aperture, in order to prevent that a heat ray reflecting layer gets damaged at the time of cleaning of an aperture, carrying out the laminating of the photocatalyst stratum functionale with a self-consecration operation which a heat ray reflecting layer can be protected [stratum functionale] and can moreover reduce the count of cleaning on a heat ray reflecting layer is performed.

[0004] However, in order to make it paste up in case lamination construction of this laminated film is carried out at an aperture, removing water and air bubbles sticking a laminated film on an aperture through the water of surface-active-agent content, and grinding a film front face against tools, such as clearance G, the problem which an abrasion produces is in the photocatalyst stratum functionale used as the maximum front face.

[0005]

[Problem(s) to be Solved by the Invention] The purpose of this invention is to offer the layered product which has the heat ray reflex function which is excellent in an inside-of-a-house aperture at abrasion-proof nature in case lamination construction is carried out, and shows a heat ray reflex function, and the function can moreover maintain over a long period of time.

[0006]

[Means for Solving the Problem] This invention on one side of a transparence thermoplastics film (A) A heat ray reflecting layer (B), The laminating of the photocatalyst stratum functionale (C) and the surface-protection film (D) is carried out in this order. And it is the layered product which carried out the laminating of an adhesive layer (E) and the ** form film (F) to that opposite transparence

thermoplastics film (A) side in this order. It is the layered product which has the heat ray reflex function characterized by the ratio (Pa/Pb) of (Pb [g/cm]) being 0.9 or less in the exfoliation strength (Pa [g/cm]) of the surface-protection film (D) to the photocatalyst stratum functionale (C), and the exfoliation strength of an adhesive layer (E) to glass.

[0007] The transparence thermoplastics film (A) of the layered product of [transparence thermoplastics film (A)] this invention is a film equipped with the thermal resistance which is transparent, has flexibility and can form a vacuum evaporatio layer with a spatter, a vacuum deposition method, etc. As a polymer which constitutes this thermoplastics film, the polyester represented by polyethylene terephthalate and polyethylenenaphthalate, an aliphatic series polyamide, aromatic polyamide, polyethylene, polypropylene, etc. are illustrated. Polyester is desirable in these. Furthermore, thermal resistance, the biaxial orientation polyester film which is excellent in a mechanical strength, especially a biaxial orientation polyethylene terephthalate film are desirable.

[0008] This thermoplastics film can be manufactured by the approach learned from the former. Biaxial orientation polyester film For example, after drying polyester, It fuses with an extruder at the temperature (however, T_m : melting point of polyester) of $T_m - (T_m + 70) ^{**}$. It extrudes from dies (for example, T-die, I-die, etc.) to rotation cooling drum lifting. Quench at 40-90 degrees C, manufacture an unstretched film, and, subsequently to a lengthwise direction, this unstretched film is extended by one 2.5 to 8.0 times the scale factor of this at the temperature (T_g : glass transition temperature of polyester) of $-(T_g - 10) (T_g + 70) ^{**}$. It extends for a scale factor 2.5 to 8.0 times the longitudinal direction of this, and can manufacture by carrying out heat setting for 1 - 60 seconds at the temperature of 180-250 degrees C if needed. The thickness of a thermoplastics film has the desirable range of 5-250 micrometers.

[0009] In [heat ray reflecting layer (B)] this invention, the heat ray reflecting layer (B) prepared in one side of a transparence thermoplastics film (A) is a layer which has the heat ray reflective engine performance or the heat ray electric shielding engine performance, and is a layer which comes to carry out the laminating of a metal layer and the dielectric layer by turns.

[0010] The semi-conductor thin film which has large optical band gaps, such as In 2O3 (ITO) which doped metals and those alloys, such as Au, Ag, Cu, and aluminum, or SnO2 which doped Sb and Sn as metal matter which constitutes the metal layer in this invention, and a high free electron consistency is illustrated. One or more sorts of metals chosen from Au, Ag, and Cu or those alloys are desirable in these, and especially Ag that does not almost have absorption of a visible ray is desirable. In addition, two or more sorts of metal matter may be used together if needed. As the formation approach of this metal layer, vapor growth is desirable, and a vacuum deposition method, a sputtering technique, or especially a plasma-CVD method is still more desirable. As for the thickness of a metal layer, it is desirable to set up so that integral near infrared ray permeability [in / in the integral light permeability in the wavelength of 400-750nm of the layered product of this invention / 55% or more and the wavelength of 750-2100nm] may satisfy 50% or less of range, and its range which is 5-1000nm is desirable. Sufficient heat ray reflection effect is not demonstrated with thickness being less than 5nm, but if infrared permeability becomes high and exceeds 1000nm of another side, light permeability will fall and transparency will worsen.

[0011] In order to control reflection of a visible ray and to raise transparency, the dielectric layer in this invention is transparent, and needs to be a high refractive index. As such a dielectric, TiO2, ZrO2, SnO2, and In2O3 grade are mentioned. Since TiO2 or ZrO2 of the organic compound origin obtained by hydrolysis of alkyl titanate or an alkyl zirconium are excellent in workability, it is desirable. In addition, indium oxide and tin oxide are also applicable in a monolayer or a multilayer as a dielectric layer. As the formation approach of this dielectric layer, vapor growth is desirable, and a vacuum deposition method, a sputtering technique, or especially a plasma-CVD method is still more desirable. Moreover, the amelioration effectiveness of a dielectric layer of transparency increases by taking the laminating configuration whose above-mentioned metal layer is pinched in the shape of sand WICHI. The thickness of a dielectric layer has desirable 750nm or less.

[0012] As for the thickness of the above-mentioned metal layer and a dielectric layer, in this invention,

it is desirable to set up so that integral near infrared ray permeability [in / in the integral light permeability in the wavelength of 400-750nm of the laminated film of this invention / 55% or more and the wavelength of 750-2100nm] may satisfy 50% or less of range.

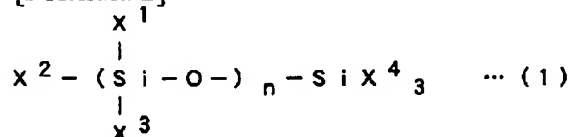
[0013] In [photocatalyst stratum-fonctionale (C)] this invention, the photocatalyst stratum fonctionale (C) which consists of a constituent which consists of hydrolysis condensates of a titanic-acid ghost and a hydrolysis nature silicon compound on the above-mentioned heat ray reflecting layer (B) is prepared.

[0014] The titanic-acid ghost which constitutes the photocatalyst stratum fonctionale shows a catalysis to the oxidation reduction of the organic substance by the exposure with specific energy of light, and what is called water titanium oxide besides a pure titanic-acid ghost, hydration titanium oxide, metatitanic acid, an alt.titanic acid, and hydroxylation titanium is included. What is in a low hypo---ic acid-ized condition from a titanium dioxide or this is used especially preferably. Any of an anatase mold, a rutile mold, and a FURUKKAITO mold are sufficient as the crystal mold of a titanium dioxide, and although these mixtures are sufficient again, especially an anatase mold is desirable. These titanic-acid ghosts are impalpable powder-like, the particle size is seen from the strength of photocatalyst activity, and what is 0.001-0.5 micrometers is desirable. Although this impalpable powder may be used as powder of dryness, in order to carry out homogeneity distribution with the hydrolysis condensate of the below-mentioned hydrolysis nature silicon compound, what is beforehand considered as the dispersing element is desirable. Whether in the constituent in this invention, the titanic-acid ghost is distributed good influences the photocatalyst function when forming a paint film greatly. A titanic-acid ghost is manufactured by various well-known approaches. For example, the approach of hydrolyzing titanium compounds, such as A. sulfuric-acid titanyl, a titanium chloride, and an organic titanium compound, under existence of a nucleation kind if needed, B. to titanium compounds, such as sulfuric-acid titanyl, a titanium chloride, and an organic titanium compound Alkali is added under existence of a nuclear shaping kind if needed, and the approach of carrying out vapor phase oxidation of the approach of neutralizing, C. titanium chloride, the organic titanium compound, etc., the method of calcinating the titanic-acid ghost obtained by the approach of the D. above A and B, etc. are mentioned. Since especially the titanic-acid ghost obtained by said approach of A and B has the high photocatalyst function, it is desirable. In order to raise a photocatalyst function further, metallic oxides, such as metals, such as platinum, gold, silver, copper, palladium, a rhodium, and a ruthenium, ruthenium oxide, and nickel oxide, may be covered on a titanic-acid ghost front face. These titanic-acid ghosts are used for them, distributing altitude to solvents, such as water. In order to carry out homogeneity distribution with solvents, such as water, without making the titanic-acid ghost used as an ultrafine particle condense secondarily, saving as acidity or alkalinity is desirable. When putting on the bottom of acidity, it is desirable pH 0.5-4 and to carry out to especially 1-3.5. The mixture of water besides water and alcohol may be used as a dispersion-medium object.

[0015] As a hydrolysis nature silicon compound used by this invention, alkyl silicate or halogenation silicon is mentioned and these partial hydrolysates are also included. As alkyl silicate, methyl silicate, ethyl silicate, isopropyl silicate, etc. are used. The compound expressed with the following type (1) is desirable in these.

[0016]

[Formula 2]



[0017] (n expresses the integer of 0-8 among a formula (1), and X1, X2, X3, and X4 express the alkoxy group of a halogen atom or carbon numbers 1-8, respectively.) however, X1, X2, X3, and X4 are mutually the same -- or you may differ.

[0018] Each of these hydrolysis nature silicon compounds has especially the desirable alkyl silicate condensate that is used in the form of the oligomer generated by the monomer or partial hydrolysis, and

is expressed with general formula $\text{SinOn-1(OR)}_{2n+2}$ (however, n 2-6R alkyl group of carbon numbers 1-4) as oligomer. As for these oligomer, mixture is also used. This hydrolysis nature silicon compound forms a titanic-acid ghost and a constituent with the hydrolyzed gestalt. as the catalyst when hydrolyzing -- both an acid and alkali -- although -- it can be used. When a titanic-acid ghost dispersing element is acidity, the alkyl silicate hydrolyzed from the acid is desirable. As for the distributed solvent of hydrolysis liquid, the alcohol of 1-4 is used for water or a carbon number. Since ester, such as ethyl acetate, makes constituent liquid unstable, they are not desirable. Since the hydrolysis nature silicon compound used in this invention and its partial hydrolysate are used in order to combine a titanic-acid ghost, they call it a silica binder to below.

[0019] Although it can do suitably, if mixing with a titanic-acid ghost and a silica binder shows an example, it will hold the titanium-dioxide aquosity dispersion liquid of the specified quantity under acidity to 10-50-degree C solution temperature, and it carries out dropping addition, fixed-time-covering the silica binder which carried out weighing capacity to this. After dropping termination, it is made to react to the bottom of 1 - 5-hour churning, and constituent liquid is prepared. The hydrolysis catalyst of this may be added to coincidence in the case of silica binder addition, and hydrolysis may be advanced using the acid content which exists in titanium-dioxide dispersion liquid. When using the medium of an alcoholic system as a dispersion-medium object, the water / alcoholic mixing medium dispersion liquid of a titanium dioxide, and the liquid which hydrolyzed the silica binder 50 to 1500% in the alcoholic medium can be mixed under churning, and this constituent can also be obtained. In this invention, it computes with the amount of the water used with the rate of hydrolysis by making into 100% of rates of hydrolysis the case where it is used at a rate of two mols of water to one mol of silica binders. When the partial hydrolysate of the form of general formula $\text{SinOn-1(OR)}_{2n+2}$ is used, the case where it is used at a rate of n+1 mol of water to one mol of this condensation product is computed as 100% of rates of hydrolysis.

[0020] As for the rate of the titanic-acid ghost in the constituent in this invention, and a silica binder, it is desirable to consider as 4 - 70 % of the weight by the weight ratio ($\text{SiO}_2/(\text{TiO}_2+\text{SiO}_2) \times 100$) respectively converted into the titanium dioxide and the silicon dioxide. If the rate of a silica exceeds 70 % of the weight, the photocatalyst function of a titanic-acid ghost will become small, and practicality will become scarce. The rate of a wrap silica becomes large about a titanic-acid ghost particle front face, and this is regarded as since contact to the matter by which oxidative degradation should be carried out to a titanic-acid ghost will be blocked. The bond strength of a base material and titanic-acid ghosts is not enough in the mixed rate of a silica binder being 4 or less % of the weight, and it drops out easily and is hard to use it by finger touch or vibration on the other hand industrially as a paint film. The still more desirable rate of a silica binder is 10 - 50 % of the weight. A small amount of titanium alkoxide and a titanium tetrachloride may be added to the constituent in this invention. Moreover, titanium or a silane coupling agent may be added. Furthermore, various surfactants may be added, stability reservation of a constituent, and in order to get wet and to improve a property. Moreover, although little addition of the ARUKI silane or hydro silane containing two or more alkoxy groups may be carried out, the compound of these titanium and a silane shall be added to the silica conversion in the case of solid content calculation.

[0021] The approach of applying the coating liquid which contains a constituent as an approach of forming the photocatalyst stratum functionale (C) from this constituent is desirable. Furthermore, the coating liquid containing a constituent is applied and desiccation and the approach which low-temperature baking is carried out by the case and is paint-film-ized by it are desirable. Spin coating, spray coating, a bar coat, a dip method, etc. are suitably used by the configuration of the base material which the method of application should apply. Especially the thickness of a paint film has desirable 0.3-2 micrometers 0.1-3 micrometers. Although the thickness of a paint film originally is not related since it is related to the amount of the compound and the titanic-acid ghost which can be contacted by which exposes the photocatalyst activity of a titanic-acid ghost on a front face, and oxidization decomposition should be carried out Since there are few amounts of titanic-acid ghosts on a paint film front face and photocatalyst activity is not enough if an ununiformity is in paint film thickness actually, the

homogeneity which not necessarily makes distribution of a particle an ideal is not acquired but it is made not much thin, it is desirable to make it the thickness of the above-mentioned range. A paint film becomes transparent for it to be the thickness of the above-mentioned range, and the coat which has optical activity in the front face can be formed, without spoiling transparency, a color, etc. which a base material has. When coating liquid is applied, and low-temperature baking is carried out by desiccation and the case and it is paint-film-ized, a silica binder carries out hydrolysis condensation.

[0022] If the laminating of the titanate-acid ghost which has a photocatalyst function is generally carried out on the base material which consists of the organic substance, or a coat, with light energy, the organic substance will be disassembled, the adhesion of a titanate-acid ghost will fall, and, finally it will drop out. In order to prevent this conventionally, one or more layers of inorganic layers inactive to a photocatalysis needed to be prepared in the organic substance front face. On the other hand, with the configuration of the layered product of this invention, since the photocatalyst stratum functionale (C) is prepared on a heat ray reflecting layer (B), it has the effectiveness the above-mentioned inorganic layer becomes unnecessary and it is ineffective to it being possible to carry out a direct laminating.

[0023] By preparing the photocatalyst stratum functionale (C), a heat ray reflection property can continue over a long period of time, and the layered product of this invention can omit cleaning by the self cleaning effectiveness by photocatalyst activity, and can also avoid the abrasion at the time of cleaning by it.

[0024] The layered product of [surface-protection film (D)] this invention carries out the laminating of the surface-protection film (D) further to on the photocatalyst stratum functionale (C). In order to carry out a laminating to a photocatalyst stratum-functionale (C) side, a surface-protection film (D) is the configuration of having prepared the adhesive layer (D2) in one side of a base material film (D1), and it is desirable to carry out a laminating to a photocatalyst stratum-functionale (C) side through an adhesive layer (D2). As for the exfoliation strength to the photocatalyst stratum functionale (C) of an adhesive layer (D2), it is desirable that they are 180 or less g/cm. If exfoliation strength exceeds 180 g/cm, since the titanate-acid ghost of the photocatalyst stratum functionale (C) may drop out partially, it is not desirable in the case of exfoliation. If the binder which constitutes an adhesive layer (D2) satisfies the range of the above-mentioned exfoliation strength, it will not be limited especially, for example, a synthetic-rubber system and an acrylic binder will be mentioned. Even if the binder which constitutes an adhesive layer (D2) is the same about the binder which constitutes the below-mentioned adhesive layer (E), and its presentation system, they may differ. Moreover, it is desirable to take the approach of vanishing the exfoliation strength of an adhesive layer (D2) by UV irradiation, and exfoliating a surface-protection film (D) by using the constituent which becomes the binder which constitutes an adhesive layer (D2) from an acrylic adhesion polymer, an acrylic monomer, oligomer, and a photopolymerization initiator. As a base material film (D1), it has flexibility, and especially if it is a film with the reinforcement of extent which does not give an abrasion to the photocatalyst stratum functionale (C) in the case of attachment construction, it will not be limited. For example, polyester film, such as a polyethylene terephthalate film, a polyamide film, a polyolefine film, etc. are mentioned.

[0025] An adhesive layer (E) is prepared in the field and opposite side which prepared the heat ray reflecting layer (B) of a transparence thermoplastics film (A) in the layered product of [adhesive layer (E)] this invention. The layered product of this invention is pasted together by the windowpane through this adhesive layer (E). The exfoliation strength to the glass of the binder which constitutes an adhesive layer (E) has the desirable range of 200g/cm or more. A layered product separates from a windowpane that exfoliation strength is less than 200 g/cm, and it may fall. Moreover, it is required for the range of the ratio (Pa/Pb) of (Pb) to be 0.005-0.9 preferably 0.9 or less in the exfoliation strength [as opposed to (Pa) and glass in the exfoliation strength of a surface-protection film (D) to the photocatalyst stratum functionale (C)] of an adhesive layer (E). If a ratio exceeds 0.9, in case a lamination ***** film (D) will be exfoliated in a windowpane in a layered product, since the whole layered product exfoliates, it is not desirable.

[0026] What has endurance to ultraviolet rays as a binder which constitutes an adhesive layer (E) is desirable, and an acrylic binder or a silicone system binder is desirable. The viewpoint of an adhesion

property or cost to an acrylic binder is still more desirable. In the acrylic binder from an ease, a solvent system has especially desirable control of exfoliation strength in a solvent system and an emulsion system. When using a solution polymerization polymer as an acrylic solvent system binder, a thing well-known as the monomer can be used. As a main monomer as a frame, for example, ethyl acrylate, butyl acrylate, As a comonomer for acrylic ester, such as 2-ethylhexyl acrylate and OKURIRU acrylate, being mentioned, and raising cohesive force Vinyl acetate, acrylic nitril, styrene, methyl methacrylate, etc. are mentioned. As a functional-group content monomer for making the adhesion which furthermore promoted bridge formation and was stabilized give, and holding the adhesion of extent which it is also under existence of water, a methacrylic acid, an acrylic acid, an itaconic acid, hydroxyethyl methacrylate, glycidyl methacrylate, etc. are mentioned. The polymerization of a binder can be performed by the well-known approach. For example, predetermined starting material is thrown in in a reaction vessel under existence of organic solvents, such as ethyl acetate and toluene, and a polymerization can be carried out under heating by making azobis systems, such as peroxide systems, such as benzoyl peroxide, and azobisisobutyronitril, into a catalyst. In order to raise molecular weight, it is better than the approach of carrying out the package injection of the monomer, and the toluene in which a chain transfer multiplier controls polymer growth greatly by the organic solvent species used again to use ethyl acetate in early stages. As for the weight average molecular weight (Mw) of a polymer, 400,000 or more are desirable, and 500,000 or more are still more desirable. When molecular weight removes after the passage of time after the holding power evaluation to which what has enough cohesive force is not obtained, but a load is applied even if a bridge is constructed with an isocyanate curing agent less than by 400,000 also fell immediately and it stuck on the glass plate, a binder may remain in a glass plate.

[0027] As a curing agent of a binder, although a common isocyanate system curing agent and an epoxy system curing agent can be especially used by the acrylic solvent system, it passes, in order to obtain a uniform coat, and since the fluidity of a binder and bridge formation by the time are required, an isocyanate system curing agent is desirable.

[0028] In this invention, in order to make the ratio (Pa/Pb) of (Pb [g/cm]) or less into 0.9 in the exfoliation strength (Pa [g/cm]) of the surface-protection film (D) to the photocatalyst stratum functionale (C), and the exfoliation strength of an adhesive layer (E) to glass, it can attain by adjusting the exfoliation strength of the binder of an adhesive layer (E) or the adhesive layer (D2) of a surface-protection film. In the case of for example, an acrylic binder, the exfoliation strength of a binder can be adjusted with the glass transition temperature, the molecular weight, or the curing agent addition of an acrylic adhesion polymer, and its accommodation by the curing agent addition is desirable at a simple point on manufacture in these. In detail, if a curing agent addition is made to increase, exfoliation strength will fall.

[0029] The above-mentioned binder can also be made to contain a stabilizer, an ultraviolet ray absorbent, a flame retarder, an antistatic agent, etc. as an additive. The thickness of an adhesive layer (E) has desirable 5-50 micrometers. An adhesive layer (E) is prepared by applying the above-mentioned binder to one side of a transparence thermoplastics film (A). The well-known approach of arbitration can be used as the method of application, and the die coating-machine method, the gravure coating-machine method, the blade coating-machine method, the spray-coater method, the Ayr knife coat method, a dip coating method, etc. are mentioned. Furthermore, it is desirable to perform chemical cleaning, such as organic [of physical surface treatment, such as flame treatment, corona discharge treatment, and plasma electrodischarge treatment, and easy adhesiveness] or inorganic resin spreading, on a transparence thermoplastics film (A) front face for the purpose on adhesion and a coating disposition in front of the laminating of an adhesive layer (E) if needed.

[0030] The laminating of the ** form film is carried out to the adhesive layer (E) front face of the layered product of [** form film (F)] this invention for protection of an adhesive layer. Especially as long as it can exfoliate a layered product easily on glass just before *****, this ** form film (F) may not have a limit, and may be well-known.

[0031] As a ** form film, the thing of a configuration of having prepared the mold releasing layer in the

organic high polymer film is desirable. As this organic high polymer film, polyester film is desirable, and the biaxial-stretching polyester film which is excellent in a mechanical strength and heat dimensional stability is still more desirable. the crystalline line which the polyester which constitutes this polyester film becomes from an aromatic series dibasic-acid component and a diol component -- it is desirable that it is saturated polyester, for example, polyethylene terephthalate, polypropylene terephthalate, polybutylene terephthalate, polyethylene -2, 6-naphthalate, etc. are illustrated. Polyethylene terephthalate, polyethylene -2, and 6-naphthalate are still more desirable in these. Moreover, although what is necessary is just the layer which consists of ** which has well-known mold releasability as a mold releasing layer, the layer which consists of hardening mold silicone resin is desirable. As hardening mold silicone resin, what was generally known as a ** form agent can be used, for example, it can be used for a "silicone ingredient handbook" (the volume for Toray Industries Dow Corning, 1993.8) etc., choosing it as it from the well-known things of a publication. for example, the product made from Shin-etsu Silicone -- KS-847(H) KS-776 and Toshiba Silicone TPR-6700 grade can be mentioned. As these hardening methods, heat or a radiation-curing mold is common. The gestalt of this hardening mold silicone resin can be suitably chosen from a solvent mold, an emulsion mold, a non-solvent mold, etc., and can be used. A mold releasing layer can make a base material film able to apply and dry and harden the coating liquid containing the above-mentioned silicone resin, and can be prepared. As an approach of applying coating liquid, a spin coat method, a spray coating method, the bar coat method, the gravure coat method, the reverse coat method, and a comma coating method can be used, for example. As for spreading, it is desirable to carry out so that the film thickness after desiccation may be set to 0.05-1.0 micrometers.

[0032]

[Example] Hereafter, an example is hung up and this invention is further explained to a detail. The following approaches measured and estimated the property of a film.

[0033] (1) Spray the water which contains a surfactant in one side of a glass plate with a creation thickness [of a measurement sample] of 3mm, draw a front face through for water and the air bubbles between lamination, a glass plate, and a layered product by the clearance G made of rubber, and remove the binder layer of the layered product created in the example and the example of a comparison in the field. It maintains after that for 12 hours, the protection film of a layered product is removed, and a measurement sample is created.

[0034] (2) Measure the amount of infrared reflection of the measurement sample in the wavelength range of 5-25 micrometers using an infrared reflection factor spectrophotometer (Jasco Corp.: FT-IR/700). A reflection factor asks for reflection of silver as 100%.

[0035] (3) The following criteria estimate visual observation of the lamination situation in the case of creation of the abrasion-proof nature above-mentioned measurement sample, and the abrasion crack of the measurement sample front face after protection film exfoliation.

O :lamination situation -- good -- abrasion-crack-less **: -- those detailed with an abrasion crack -- x:attachment -- a defect or those with an abrasion crack [0036] (4) Exfoliation strength (Pa, Pb) (Pb, unit:g/cm) were measured in exfoliation strength when 180 degrees exfoliates a laminated film from a measurement sample with (Pa, unit:g/cm) in exfoliation strength when 180 degrees exfoliates a protection film at the time of the above-mentioned measurement sample creation.

[0037] [Example 1] The polyethylene terephthalate (500 ppm content of lubricant) of the intrinsic viscosity 0.65 measured in 35-degree C o-chlorophenol is compounded. Carry out melting extrusion to rotation cooling drum lifting which maintained this polyethylene terephthalate at 20 degrees C, and an unstretched film with a thickness of 1580 micrometers is obtained. Next, after extending 3.5 times to machine shaft orientations, it extended 3.9 times in the longitudinal direction, heating at 105 degrees C succeedingly, and heat-treated at 210 more degrees C, and polyester film with a thickness of 50 micrometers was obtained. The heat ray reflecting layer was formed by preparing a titanium oxide layer (dielectric layer; the 1st layer) with a thickness of 15nm in one side of this film, preparing a silver larer (metal layer; the 2nd layer) with a thickness of 12nm on it, and preparing a titanium oxide layer (dielectric layer; the 3rd layer) with a thickness of 25nm on it further. In addition, each of three above-

mentioned layers was formed by the sputtering method under a vacuum (5×10^{-5} torr). Next, the coating liquid (ST-K03: made in COL Coat) which dissolved the constituent of the rate which converts into $\text{TiO}_2/\text{SiO}_2$, and serves as the 50 sections / 50 section as a constituent of the anatase mold titanium-dioxide particle of 0.07-0.1 micrometers of mean diameters and ethyl silicate in the solvent, and was used as the solution of 10% of solid content concentration was coated with the coverage of 5 g/m², it dried for 2 minutes and 150 degrees C of photocatalyst stratum functionale were formed. In the field of another side of polyester film, the exfoliation strength to glass applied the 500g [/cm] acrylic binder so that it might become 20 micrometers of desiccation thickness, and it obtained the laminated film. Furthermore, the film with which exfoliation strength carried out the laminating of the 50g [/cm] acrylic binder to one side of a polyethylene terephthalate film with a thickness of 25 micrometers so that it might become with 15 micrometers of desiccation thickness was created as a protection film, and lamination ***** was created for this on the photocatalyst stratum functionale of the above-mentioned laminated film. The property of this laminated film is shown in Table 1.

[0038] The layered product was created by the same approach as an example 1 except using the ultraviolet curing mold binder whose exfoliation strength after UV irradiation is 10 g/cm for the binder of a [example 2] protection film. The property of this laminated film is shown in Table 1. In addition, ultraviolet rays were irradiated before exfoliation of a protection film at the measurement sample.

[0039] The layered product was created by the same approach as an example 1 except not carrying out the laminating of the [example 1 of comparison] protection film. The property of this laminated film is shown in Table 1.

[0040] The layered product was created by the same approach as an example 1 except using the binder (it being :500 g/cm in the exfoliation strength to glass) which forms a binder layer for the binder of the [example 2 of comparison] protection film. The property of this laminated film is shown in Table 1.

[0041]

[Table 1]

| | Pa/Pb Infrared reflection factor (%) | Abrasion-proof nature |
|---------------------------|--|-----------------------|
| Example 1 | 0.1 90 O (good) | |
| Example 2 | 0.1 90 O (good) | |
| Example 1 of a comparison | 10 ** (detailed abrasion crack) | |
| Example 2 of a comparison | 1.0 75 x (poor pasting, surface exfoliation) | |

----- [0042]

[Effect of the Invention] According to this invention, in the heat ray reflective film used for inside-of-a-house apertures, it excels in a heat ray reflex function and a sex with a crack-proof, and the film which this effectiveness can moreover maintain over a long period of time can be offered.

[Translation done.]

* NOTICES *

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

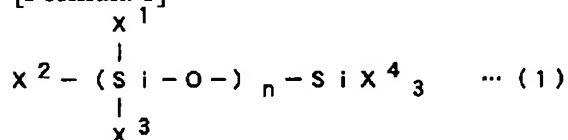
CLAIMS

[Claim(s)]

[Claim 1] The laminating of a heat ray reflecting layer (B), the photocatalyst stratum functionale (C), and the surface-protection film (D) is carried out to one side of a transparence thermoplastics film (A) in this order. And it is the layered product which carried out the laminating of an adhesive layer (E) and the ** form film (F) to that opposite transparence thermoplastics film (A) side in this order. The layered product which has the heat ray reflex function characterized by the ratio (Pa/Pb) of (Pb [g/cm]) being 0.9 or less in the exfoliation strength (Pa [g/cm]) of the surface-protection film (D) to the photocatalyst stratum functionale (C), and the exfoliation strength of an adhesive layer (E) to glass.

[Claim 2] The layered product which has the heat ray reflex function according to claim 1 this whose hydrolysis nature silicon compound this photocatalyst stratum functionale (C) consists of a constituent which consists of hydrolysis condensates of a titanic-acid ghost and a hydrolysis nature silicon compound, and the mean particle diameter of this titanic-acid ghost is 0.001-0.5 micrometers, and is a compound expressed with the following formula (1).

[Formula 1]



(n expresses the integer of 0-8 among a formula (1), and X¹, X², X³, and X⁴ express the alkoxy group of a halogen atom or carbon numbers 1-8, respectively.) however, X¹, X², X³, and X⁴ are mutually the same -- or you may differ.

[Claim 3] The layered product which has the heat ray reflex function according to claim 1 or 2 by which a surface-protection film (D) is a film with which the exfoliation strength to the photocatalyst stratum functionale (C) prepared the adhesive layer (D2) of 180 or less g/cm in one side of a base material film (D1), and the laminating of the photocatalyst stratum functionale (C) is carried out to the surface-protection film (D) through this adhesive layer (D2).

[Claim 4] The layered product in which the exfoliation strength of an adhesive layer (E) to glass has the heat ray reflex function according to claim 1 to 3 which is 200 or more g/cm.

[Translation done.]